IS 8214-1 (1976): Glossary of ships' hydrodynamic terms, Part 1 Basic quantities [TED 17: Shipbuilding]

BLANK PAGE

IS : 8214 (Part I) - 1976

Indian Standard

GLOSSARY OF SHIPS' HYDRODYNAMIC TERMS

PART I BASIC QUANTITIES

First Reprint SEPTEMBER 1983
(Incorporating Amendment No. 1)

UDC 629.12:532.51:001.4

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

February 1977

Gr 3

AMENDMENT NO. 1 DECEMBER 1977
TO
IS : 8214 (Part I) - 1976 GLOSSARY OF SHIPS' HYDRODYNAMIC TERMS
PART I BASIC QUANTITIES

Corrigenda

(*Page* 3, *clause* 0.2, *line* 4) — Substitute 'ease' *for* 'case'.

(*Page* 5, *informal table, second column, against Sl No.* 2.27) — Substitute 'Q' *for* 'O'.

(*Page* 7, *informal table, fourth column, against Sl No.* 2.48) — Substitute the following for the existing equation:

$$F(t) = Ae^{-\delta t} \sin \frac{2(t-t_0)}{T}$$

(MCPD 1)

Printed at Simco Printing Press Delhi, India

Indian Standard

GLOSSARY OF SHIPS' HYDRODYNAMIC TERMS

PART I BASIC QUANTITIES

Shipbuilding Sectional Committee, MCPD 1

Chairman	*Representing*
SHRI S. PARMANANDHAN	Ministry of Defence (NHQ)
Members	
CDR S. P. AGARWALA	Ministry of Defence (DGI)
SHRI N. CHAKRABORTY	Ministry of Shipping and Transport
SHRI S. RAGHAVAN (*Alternate*)	
CHIEF MECHANICAL ENGINEER, CALCUTTA PORT TRUST	Port Consultative Organization, New Delhi
CHIEF MECHANICAL ENGINEER, BOMBAY PORT TRUST (*Alternate*)	
SHRI V. G. DAMLE	AFCO Ltd, Bombay; *and* Institute of Marine Technologists, Bombay
SHRI R D. PARALKAR (*Alternate*)	AFCO Ltd, Bombay
SHRI A T. JOSEPH (*Alternate*)	Institute of Marine Technologists, Bombay
SHRI I. N. PRADHAN (*Alternate*)	
SHRI R. S. SACHDEV (*Alternate*)	
DIRECTOR OF NAVAL CONSTRUCTION	Ministry of Defence (NHQ)
SHRI V. P. GOYAL	Mukand Iron & Steel Works Ltd, Bombay
SHRI SUDARSHAN KUMAR (*Alternate*)	
SHRI D. B. IRANI	Directorate General of Shipping, Bombay
SHRI G. K KURIYAN	Central Institute of Fisheries Technology, Cochin
SHRI M. VELU (*Alternate*)	
SHRI M G KUTTY	Indian Engineering Association, Bombay
SHRI I N PRADHAN	Indian National Shipowners' Association, Bombay
PRESIDENT	Institute of Marine Engineers, Bombay
SHRI P C. KUMAR (*Alternate*)	
SHRI T. S. RAJAN	Ericson & Richards, Bombay
SHRI H S. RAO	Indian Register of Shipping, Bombay
CAPT D. S. RUPA	Shipping Corporation of India Ltd, Bombay
SHRI S. SUNDARAM (*Alternate*)	

(*Continued on page 2*)

(*Continued from page* 1)

Members	*Representing*
SHRI R. SARANGARAJAN	Directorate General of Technical Development, New Delhi
SHRI B R. SAWARKAR SHRI P. R. GOYIL (*Alternate*)	Cochin Shipyard Ltd, Cochin
SHRI W R. D SAXTON SHRI D. MADHOK (*Alternate*)	Lloyd's Register of Shipping, Bombay
SHRI S. G SCHAEFFER SHRI K. SHARMA (*Alternate*)	American Bureau of Shipping, Bombay
SHRI A. K SEN	Garden Reach Workshops Ltd, Calcutta
SHRI D S SHETH SHRI M. G. KUTTY (*Alternate*)	Hindustan Shipyard Ltd, Visakhapatnam
SHRI G. SINHA SHRI H SVENSSON (*Alternate*)	SF India Ltd, Calcutta
SHRI T N SUJAN	Larsen & Toubro Ltd, Bombay
SHRI P S DAS, Director (MCPD)	Director General, ISI (*Ex-officio Member*)

Secretary

SHRI V. K. SEHGAL
Assistant Director (MCPD), ISI

Indian Standard

GLOSSARY OF SHIPS' HYDRODYNAMIC TERMS

PART I BASIC QUANTITIES

0. FOREWORD

0.1 This Indian Standard (Part I) was adopted by the Indian Standards Institution on 30 September 1976, after the draft finalized by the Shipbuilding Sectional Committee had been approved by the Marine, Cargo Movement and Packaging Division Council.

0.2 The object of this standard is to specify the technical and scientific terms used in ship geometry, hydrostatics and hydrodynamics and to facilitate the exchange of information, particularly at international level, and the ease of understanding as regards to documents relating to naval architecture.

0.3 The terms are represented by symbols which have been arranged in alphabetical order for ease of interpretation.

0.4 No rules are laid down as to whether subscripts are to be shown by capital or lower case letters, although the letters shown in this standard are in the preferred style.

0.5 When required, the suffixes M and S should be introduced to distinguish between quantities referring to model and ship respectively.

0.6 For guidance, a complete list of Greek alphabets is given in Appendix A.

0.7 This standard is being issued in six parts. The other parts in the series are:

Part II Ship geometry
Part III Resistance and propulsion
Part IV Sea keeping
Part V Manoeuvrability
Part VI Strength and vibration

0.3 While preparing this standard, current work by ISO/TC 8 on 'Terminology of Profiles and Hydrodynamic Terms' and International Towing Tank Conference (I.T.T.C) has also been considered.

1. SCOPE

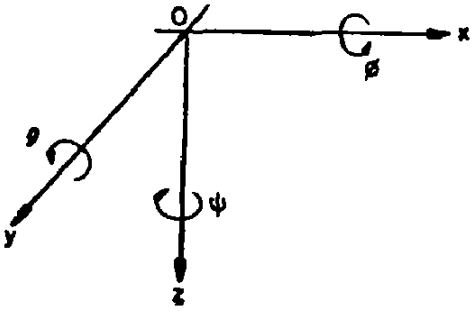
1.1 This standard (Part I) deals with basic quantities used in ships' hydrodynamic terms.

2. TERMINOLOGY

Sl No.	Symbol	Terms	Definitions	Symbol of SI Units
2.1	a	Linear acceleration	$\frac{dv}{dt}$	ms^{-2}
2.2	A	Area in general	—	m^2
2.3	A_T	Cross-sectional area of an experiment tank or tunnel	—	m^2
2.4	B	Breadth in general	—	m
2.5	c	Velocity of sound	—	ms^{-1}
2.6	D,d	Diameter in general	—	m
2.7	E	Energy in general	—	Nm
2.8	F	Force in general	—	N
2.9	f	Frictional coefficient	Ratio of tangential force to normal force between two sliding bodies or planes	—
2.10	g	Acceleration due to gravity	—	ms^{-2}
2.11	h	Depth in general	—	m
2.12	h	Pressure head in general	—	m
2.13	ζ_w	Height of a wave	Vertical distance between the crest and trough of a surface wave	m
2.14	H_i	Total head, Bernoulli	$h + \frac{p}{w} + \frac{q}{w}$	m

Sl. No.	Symbol	Term	Definitions	Symbol of SI Units
2.15	K_s	Sand roughness	Mean diameter of the equivalent sand grains covering a surface	m
2.16	L	Length in general	—	m
2.17	L_W,λ	Wave length	Length between two successive similar points of the wave profile in the direction of propagation, for instance, between successive troughs	m
2.18	m	Mass	—	kg
2.19	M	Moment in general	—	Nm
2.20	n	Rate of revolution	—	s^{-1}
2.21	p	Pressure intensity in general	Force per unit area	Nm^{-2}
2.22	p_c	Cavitation pressure	Pressure at the cavitation start point	Nm^{-2}
2.23	p_v	Vapour pressure of water	—	Nm^{-2}
2.24	p_∞	Ambient pressure at infinity	—	Nm^{-2}
2.25	P	Power in general	$P = \frac{E}{t}$	W
2.26	q	Dynamic pressure	$\frac{1}{2}\rho U^2$	Nm^{-2}
2.27	Q	Rate of flow	Volume of fluid per unit time	$m^3 s^{-1}$
2.28	r,R	Radius in general	—	m
2.29	R_C	Radius of curvature	—	m
2.30	R_H	Radius, hydraulic	Area of section divided by wetted perimeter	m
2.31	s	Length along path	—	m
2.32	t	Time in general	—	s
2.33	t_o	Temperature in general	—	°C

Sl No.	Symbol	Terms	Definitions	Symbol of SI Units
2.34	T	Period of time for a complete cycle	Time interval of a complete cycle of a periodical phenomenon	s
2.35	u,v,w	Velocity components in direction of x,y,z axes	—	ms^{-1}
2.36	U,V	Linear velocity	$\frac{ds}{dt}$	ms^{-1}
2.37	∇,V	Volume in general	—	m^3
2.38	w	Weight density	ρg	Nm^{-3}
2.39	W	Weight in general	—	N
2.40	x,y,z	Body axis and Cartesian co-ordinates	Right hand orthogonal system of axes fixed in the body with the z-axis vertically downwards. The x-axis forward and parallel to reference or base line used to determine body's shape. The origin should, in general, be at the centre of gravity of the body, any other point used must be clearly defined	m



Sl. No.	Symbol	Terms	Definitions	Symbol of SI Units
2.41	x_o, y_o, z_o	Fixed axes and corresponding Cartesian co-ordinates	Right hand orthogonal system of axes nominally fixed in relation to the earth, the positive z_o-axis is vertically downwards and the x_o-axis lies in the general direction of initial motion	m
2.42	α	Coefficient of thermal expansion (linear)	Elongation per unit length per degree change in temperature	K^{-1}
2.43	α	Angular acceleration	$\frac{d\omega}{dt}$	$rad\ s^{-2}$
2.44	γ	Specific gravity	Weight of a substance divided by the weight of an equal volume of distilled water at 4°C	—
2.45	γ	Adiabatic exponent	—	—
2.46	Γ	Circulation	$\oint \bar{V}.d\bar{s}.$ along a closed line	$m^2\ s^{-1}$
2.47	δ	Thickness of a boundary layer in general	—	m
2.48	δ	Damping coefficient	When F is a function of time given by $F(t) = Ae^{-\delta t} \sin \frac{2(t-t_0)}{T}$ δ is the damping coefficient	—

Sl No.	Symbol	Terms	Definitions	Symbol of SI Units
2.49	θ	Angle of trim or pitch	Static (trim) or dynamic (pitch) angular displacement about y-axis, of base line from its initial reference position	—
2.50	κ	Coefficient of kinematic capillarity	$\frac{\sigma}{\rho}$	$m^3 s^{-2}$
2.51	μ	Coefficient of dynamic viscosity	Shear stress per unit velocity gradient	$Ns m^{-2}$
2.52	ν	Coefficient of kinematic viscosity	$\frac{\mu}{\rho}$	$m^2 s^{-1}$
2.53	ρ	Mass density	Mass per unit volume	$kg m^{-3}$
2.54	σ	Capillarity coefficient	Surface tension per unit length	Nm^{-1}
2.55	ϕ	Potential function such as velocity potential	$u = \frac{\delta\phi}{\delta x}$, $v = \frac{\delta\phi}{\delta y}$, $w = \frac{\delta\phi}{\delta z}$	$m^2 s^{-1}$
2.56	ϕ	Angle of roll, heel or list	Static (heel) or dynamic (roll) angular displacement, about x-axis, of the plane of symmetry from its initial reference position	—
2.57	Ψ	Stream function	Ψ = Const. is the equation of a stream line	$m^3 s^{-1}$
2.58	Ψ	Angle of yaw	Dynamic angular displacement about z-axis of the plane of symmetry from its initial reference position	—
2.59	ω	Angular velocity or circular frequency	Angle per unit time	$rad s^{-1}$

APPENDIX

(*Clause* 0.6)

GREEK ALPHABETS

A	α	alpha	N	ν	nu
B	β	beta	Ξ	ξ	xi
Γ	γ	gamma	O	ο	omicron
Δ	δ	delta	Π	π	pi
E	ε	epsilon	P	ρ	rho
Z	ζ	zeta	Σ	σ	sigma
H	η	eta	T	τ	tau
Θ	θ	theta	Υ	υ	upsilon
I	ι	iota	Φ	φ	phi
K	κ	kappa	X	χ	chi
Λ	λ	lambda	Ψ	ψ	psi
M	μ	mu	Ω	ω	omega

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Conversion*
Force	newton	N	1 N = 1 kg. 1 m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

INDIAN STANDARDS INSTITUTION

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones : 26 60 21, 27 01 31 **Telegrams : Manaksanstha**

Regional Offices:		Telephone
Western : Novelty Chambers, Grant Road	BOMBAY 400007	37 97 29
Eastern : 5 Chowringhee Approach	CALCUTTA 700072	23-08 02
Southern : C I T. Campus, Adyar	MADRAS 600020	41 24 42
Branch Offices:		
'Pushpak', Nurmohamed Shaikh Marg, Khanpur	AHMADABAD 380001	2 03 91
'F' Block, Unity Bldg, Narasimharaja Square	BANGALORE 560002	2 76 49
Gangotri Complex, Bhadbhada Road, T.T. Nagar	BHOPAL 462003	6 27 16
22E Kalpana Area	BHUBANESHWAR 751014	5 36 27
Ahimsa Bldg, SCO 82-83, Sector 17C	CHANDIGARH 160017	2 83 20
5-8-56C L N Gupta Marg	HYDERABAD 500001	22 10 83
D-277 Todarmal Marg, Banipark	JAIPUR 302006	6 98 32
117 418 B Sarvodaya Nagar	KANPUR 208005	8 12 72
Patliputra Industrial Estate	PATNA 800013	6 28 08
Hantex Bldg (2nd Floor), Rly Station Road	TRIVANDRUM 695001	32 27